

**REMARKS**

Claims 1-6, 8-11 and 13-26 are pending in the present application. Claims 4, 10, and 15-23 are withdrawn from consideration. Claims 1-3, 8, 13 and 14 are herein amended. Claims 7 and 12 are herein cancelled. Claims 24-26 are newly added. No new matter has been entered.

The claims have been amended to recite the following additional limitations.

(1) "Having low water solubility"

The present invention uses apatite which would not easily deposit. If it is easily soluble in water, then the apatite exposed on the surface is dissolved in the rain water when exposed outdoors, and as a result, photocatalyst particles fall off, and the effect of the photocatalyst sheet is lost. On the other hand, in the present invention, a superb effect is attained from having low solubility in water by which photocatalyst particles can be held on the sheet. Support for the amendment is in the specification at, *e.g.*, page 12.

(2) "Particle diameter of said photocatalyst is 1 nm to 100 nm"

The smaller the particle diameter, the larger the surface area of photocatalyst fine particles. If the particle diameter of photocatalyst particles is large, it affects the mutual thermal soldability of photocatalyst sheets. Support for the amendment is in the specification at, *e.g.*, p. 11.

(3) "Ratio of the apatite-coated photocatalyst particles to the photocatalyst-containing layer is 10-40 weight %" (Not added by amendment.)

In the present invention the ratio of the apatite-coated photocatalyst particles to the photocatalyst-containing layer is set in order to obtain the mutual thermal soldability of photocatalyst sheets.

As shown in Example 4 and 5 of Fig. 6, in the case that the ratio of the apatite-coated photocatalyst particles to the photocatalyst-containing layer is over 40 weight %, the results of Photo-redox reaction and Mass changes are good. However, the results of Peeling test are Δ or X.

(4) “Coating quantity of said apatite coated on said photocatalyst particles”

In the present invention, the coating quantity of the apatite coated on the photocatalyst particles is set in order to obtain the photocatalytic function and to prevent decomposition of a photocatalyst-containing layer. The rate in (3) is based on the photocatalyst particles. Support for the amendment is in the specification at, *e.g.*, page 11 and original claim 7.

(5) “Water contact angle of the photocatalyst sheet surface is 130 degrees or less”

Since a photocatalyst sheet is wetted by a photocatalytic reaction, when photocatalyst sheets are used for film/fabric structure constructions or tents, falling of dew drops formed by dew formation can be prevented.

That is, the effect is not only decomposition of polluting substances by photocatalytic reactions, but also prevention of falling of dew drops formed by dew formation inside a room. Support for the amendment is in the specification at, *e.g.*, page 13.

(6) “Coated layer can be peeled from the substrate when a pair of photocatalyst sheets are mutually thermally welded to form a welded part and when the welded part is peeled off by a test at the rate of 50 mm/min”

The surface of photocatalytic sheet of the present invention has a superior property as to thermal soldability. When a pair of the photocatalyst sheets are mutually thermally welded, the overlapped surfaces of the sheets are fully adhered. Support for the amendment is in the specification at, *e.g.*, page 23 and Figs. 6 and 7.

In addition, new claims 24-26 recite that two or more photocatalyst sheets are mutually welded to each other. Support for this limitation is in the specification at, *e.g.*, pages 3-4 and Fig. 5.

**Claim Rejections – 35 U.S.C. §112**

Claims 1-3, 5-9 and 11-15 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Office Action stated that there is insufficient antecedent basis for the limitation “said welded part.” Claims 1-3 have been amended for clarification.

Withdrawal of the rejection is requested.

**Claim Rejections – 35 U.S.C. §§ 102 and 103**

Claims 1-3, 5-8 and 11-15 were rejected under 35 U.S.C. § 102(b) as being anticipated by **Yoshinori** (JP 2002-282703); and claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over **Yoshinori** in view of **Taoda** (US 6,180,548).

Favorable reconsideration is requested.

Reference 1 (JP2002-282703 A) discloses a molded article and a fiber structure utilizing the same.

(1) Comparison of the invention recited in Claim 1 and the cited References

The invention recited in Claim 1 and the art described in Reference 1 are related in the technological field, but they differ technologically. As explained above, the invention recited in Claim 1 has the characteristics in (i).

Reference 1 discloses the molded article in which photocatalyst particles 1 are contained in a supported layer 2 made of an organic resin, and sheet-shaped fiber structure, and arranging by coating at least on one side of the resin sheets in which resin is coated on said textiles (See Reference 1, [0021].), but "in case that said photocatalyst sheets are thermally welded by melting, when said welded part is peeled at the rate of 50 mm/min, said welded part is peeled off said substrate", as recited in the present invention, is neither disclosed nor implied.

Reference 1 describes that a supporting layer containing photocatalysts is preferably made of a thermo-plastic resin (See Reference 1, [0022].), but said aspects of the present invention are neither disclosed nor implied. Reference 1 does not disclose the concrete structure for use of a molded article as a film/fabric structure material and that the required strength can be obtained, nor the structure which can be practically used as a film/fabric structure material. Unless concrete structure and materials are specified as a film/fabric structure, the strength test of "in case that said photocatalyst sheets are thermally welded by melting, when said welded part is peeled at the rate of 50 mm/min, said welded part is peeled off said substrate" can not be performed.

In case that, using photocatalyst sheets of the invention recited in Claim 1, photocatalyst sheets are welded, the welded part is peeled off a substrate made of synthetic fiber by peeling test. This means that the weld strength between the photocatalyst-containing layer containing a resin or a rubber and the coated layer below it made of a resin or a rubber is always higher than the weld strength between the substrate made of synthetic fiber, the coated layer made of a resin or a rubber formed on said substrate, and the photocatalyst-containing layer containing a resin or a rubber formed on said coated layer. Thus, in case that photocatalyst sheets of the invention recited in Claim 1 are mutually welded, not only the photocatalyst-containing layer and the coated layer made of a resin below it are welded, but also this weld strength- is always higher than that of a substrate, the coated layer made of a resin coated on the substrate, and the photocatalyst-containing layer, so that a practical thermal weld strength as a film/fabric structure can be obtained.

Thereby, since (i) as the characteristics of the invention recited in Claim 1 is not disclosed in Reference 1, the invention recited in Claim 1 of the present application could not be easily thought of from the art of Reference 1, and the effect of (A) and (B) could not be shown, it is firmly believed that the invention recited in Claim 1 has the inventive step.

(2) Comparison of the invention recited in Claim 2 and the cited References

The invention recited in Claim 2 and the art described in Reference 1 are related in the technological field, but they differ technologically. As explained above, the invention recited in Claim 2 has the characteristics in (ii).

That is, the invention recited in Claim 2 is a photocatalyst sheet comprising especially a substrate made of polyester fiber, a coated layer made of vinyl chloride resin coated on both sides of said substrate, and a photocatalyst-containing layer coated at least on one side of said coated layer, wherein the photocatalyst-containing layer contains vinyl chloride resin, acrylic resin, and photocatalysts with the fixed apatite-coated photocatalyst particles, characterized in that, in case that said photocatalyst sheets are thermally welded by melting, when said welded part is peeled at the rate of 50 mm/mm, said welded part is peeled off said substrate.

Reference 1 neither discloses nor implies that the photocatalyst sheet of the above-described aspect has said peeling property. The concrete structure of the molded article of Reference 1 used as a film/fabric structure material and the fact that the required strength can be obtained are not disclosed, and practically, the structure which can be used as a film/fabric structure material is not disclosed at all.

Unless concrete structure and materials are specified as a film/fabric structure, the strength test of "in case that said photocatalyst sheets are thermally welded by melting, when said welded part is peeled at the rate of 50 mm/min, said welded part is peeled off said substrate" can not be performed.

In case that, using photocatalyst sheets of the invention recited in Claim 2, photocatalyst sheets are welded, the welded part is peeled off a substrate made of polyester fiber by peeling test. This means that the weld strength between the photocatalyst-containing layer containing vinyl chloride resin and acrylic resin and the coated layer below it made of vinyl chloride resin is always higher than the weld strength between the substrate made of polyester fiber, the coated

layer made of vinyl chloride resin formed on said substrate, and the photocatalyst-containing layer containing vinyl chloride resin and acrylic resin formed on said coated layer. Thus, in case that photocatalyst sheets of the invention recited in Claim 2 are mutually welded, not only the photocatalyst-containing layer and the coated layer made of a resin below it are welded, but also this weld strength is always higher than that of a substrate, the coated layer made of a resin coated on the substrate, and the photocatalyst-containing layer, so that a practical thermal weld strength as a film/fabric structure can be obtained.

Thereby, since (ii) as the characteristics of the invention recited in Claim 2 is not disclosed in Reference 1, the invention recited in Claim 2 of the present application could not be easily thought of from the art of Reference 1, and the effect of (C) and (D) could not be shown, it is firmly believed that the invention recited in Claim 2 has the inventive step.

(3) Comparison of the invention recited in Claim 3 and the cited References

The invention recited in Claim 3 and the art described in Reference 1 are related in the technological field, but they differ technologically.

As explained above, the invention recited in Claim 3 has the characteristics in (iii). That is, the invention recited in Claim 3 is a photocatalyst sheet comprising especially a substrate made of inorganic fiber, a coated layer made of fluorocarbon resin coated on both sides of the substrate made of inorganic fiber, and a photocatalyst-containing layer containing photocatalysts in the fluorocarbon resin coated at least on one side of said coated layer, wherein the photocatalyst-containing layer contains fluorocarbon resin and photocatalysts with the fixed apatite-coated photocatalyst particles, characterized in that, in case that said photocatalyst sheets

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are thermally welded by melting, when said welded part is peeled at the rate of 50 mm/mm, said welded part is peeled off said substrate.

Thereby, when the photocatalyst sheets of the present application are mutually thermally welded, and the welded part is peeled at the rate of 50 mm/mm, the whole coated layer is completely peeled off a substrate, and excellent thermal weldability can be obtained.

On the other hand, Reference 1 neither discloses nor implies that the photocatalyst sheet of the above-described aspect has said peeling property. The concrete structure of the molded article of Reference 1 used as a film/fabric structure material and the fact that the required strength can be obtained are not disclosed, and practically, the structure which can be used as a film/fabric structure material is not disclosed at all. Unless concrete structure and materials are specified as a film/fabric structure, the strength test of "in case that said photocatalyst sheets are thermally welded by melting, when said welded part is peeled at the rate of 50 mm/mm, said welded part is peeled off said substrate" can not be performed.

In case that, using photocatalyst sheets of the invention recited in Claim 3, photocatalyst sheets are welded, the welded part is peeled off a substrate made of inorganic fiber by peeling test. This means that the weld strength between the photocatalyst-containing layer containing fluorocarbon resin and the coated layer below it made of fluorocarbon is always higher than the weld strength between the substrate made of inorganic fiber, the coated layer made of fluorocarbon resin formed on said substrate, and the photocatalyst-containing layer containing fluorocarbon resin formed on said coated layer. Thus, in case that photocatalyst sheets of the invention recited in Claim 3 are mutually welded, not only the photocatalyst-containing layer and



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the coated layer made of a resin below it are welded, but also this weld strength is always higher than that of a substrate, the coated layer made of a resin coated on the substrate, and the photocatalyst-containing layer, so that a practical thermal weld strength as a film/fabric structure can be obtained.

Thereby, since (iii) as the characteristics of the invention recited in Claim 3 is not disclosed in Reference 1, the invention recited in Claim 3 of the present application could not be easily thought of from the art of Reference 1, and the effect of (E) and (F) could not be shown, it is firmly believed that the invention recited in Claim 3 has the inventive step.

Applicants respectfully submit that Yoshinori does not teach or suggest:

whereby said coated layer can be peeled from said substrate when a pair of said photocatalyst sheets are mutually thermally welded to form a welded part and when said welded part is peeled off by a peeling test at the rate of 50 mm/min

as recited in amended claims 1-3.

Yoshinori discloses a photocatalyst sheet comprising a substrate (a base material), a coated layer (an intermediate layer) and a photocatalyst-containing layer (plastic solid). (Paragraph 6 and claim 1.) The photocatalyst-containing layer contains a resin (a support layer) and photocatalyst particles (photocatalyst semiconductor grains). (Claim 1.)

Yoshinori also discloses that an apatite may be used as a material for surface modification by which photocatalyst particles are covered, and that the material for surface modification can suppress decomposition of the photocatalyst-containing layer by photocatalyst function. (Paragraph 13.)

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However, Yoshinori does not disclose thermal soldability and a condition to obtain the photocatalytic function and thermal soldability simultaneously. Yoshinori does not disclose the peeling property as recited in the claims, *i.e.*, the peeling property when a pair of the photocatalyst sheets are mutually thermally welded.

#### **New Claims**

Claims 24-26 recite that two or more photocatalyst sheets are mutually welded to each other. Applicants respectfully submit that Yoshinori does not teach or suggest this recited feature.

For at least the foregoing reasons, claims 1-3, 5, 6, 8, 9, 11, 13, 14 and 24-26 are patentable over the cited references. Accordingly, withdrawal of the rejection of claims 1-3, 5, 6, 8, 9, 11, 13 and 14 is hereby solicited.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

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If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

**WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP**

A handwritten signature in black ink, appearing to read 'A. Melick', with a long horizontal flourish extending to the right.

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